
Government of the Northwest Territories
Submissions to the

**Beaufort Sea Environmental
Assessment Panel**
1983

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POLARPAM

BEAUFORT COMMUNITY ENERGY FUTURES

PETER J. HART

OCTOBER, 1983

A. INTRODUCTION

Energy - uumajjutiit - "the forces which keep things going" - such is the Inuit meaning. Critical to modern society, more critical in the north. Without it, transportation stops, buildings cool and freeze, and business ceases production. Adequate energy supplies at affordable prices are essential to the development of the NWT now and for the generations to come.

Of all the benefits that oil and gas development can bring to an area, energy is perhaps the most obvious - perhaps too obvious. To date, little consideration has been given this topic in Panel hearings.

This paper discusses Beaufort area energy supply problems, the planning necessary to develop new solutions, and recommends ways in which the Panel can help.

The message is clear that the industrial activity now taking place in the Beaufort area could contribute to the development of a new regional energy supply system. Given the proper forethought, this system would serve the area long after production is complete. It may be found, in years to come, when the resource is depleted, that the lasting energy benefits have indeed outweighed the more temporary employment and business stimulation effects.

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B. SHOULD THE PANEL BE CONCERNED WITH BEAUFORT SEA ENERGY SUPPLY?

It is the belief of the Government of the Northwest Territories, that the answer is clearly "yes". Energy supply is a socio-economic issue which must be considered along with employment, training, and business development issues.

It is perhaps to be expected that individual residents of the area would not bring this matter to the Panel as a key issue. Energy supply is a confusing and complex issue. Moreover, the existence of subsidies in one form or another, tends to dampen public concern on this matter.

This government recognizes energy as a problem that must be solved if the N.W.T. is to fully attain the social and economic progress that it is capable of. There are several aspects of the government's concern.

1. Dependence on a Single Form

On an NWT wide basis, refined petroleum products (RPP's) account for 88% of end-use energy. Electricity accounts for 10% and wood 2%. In the Beaufort area, all electricity is generated thermally. Therefore, except for a small amount of residential wood heating, the area is totally dependent upon products of oil.

Total dependence on a single form is in itself not necessarily bad. It becomes a problem only when the

form suffers from undesirable characteristics. While refined petroleum products have some extremely attractive features - they are portable, storable and have a very high energy content per unit volume - they suffer from the undesirable facts of high cost, price instability and some supply insecurity. Each is discussed following.

2. High Cost

Energy prices in the NWT are higher than those in other parts of Canada. Charts 1 and 2 provide a comparison of heating oil and electrical costs across the country. The charts show electrical rates that exceed by a wide margin the Southern norm. On the other hand, they show that some communities in the Mackenzie Delta have fuel prices that appear reasonable in comparison to Southern Canada. In fact, both charts actually grossly understate the difference between NWT and Southern energy costs. There are essentially two other considerations that apply.

First, the colder northern climate increases the final requirement per unit of building area. Chart 3 plots "degree days" (1) for Canada as a whole with key communities noted. Though "degree days" is an imperfect measure of residential building heating load, it does

**ELECTRICAL POWER RATES TO NON-GOVERNMENT RESIDENTIAL
CONSUMERS IN THE NWT AND RESIDENTIAL CONSUMERS IN
AVERAGE CANADIAN CITIES**

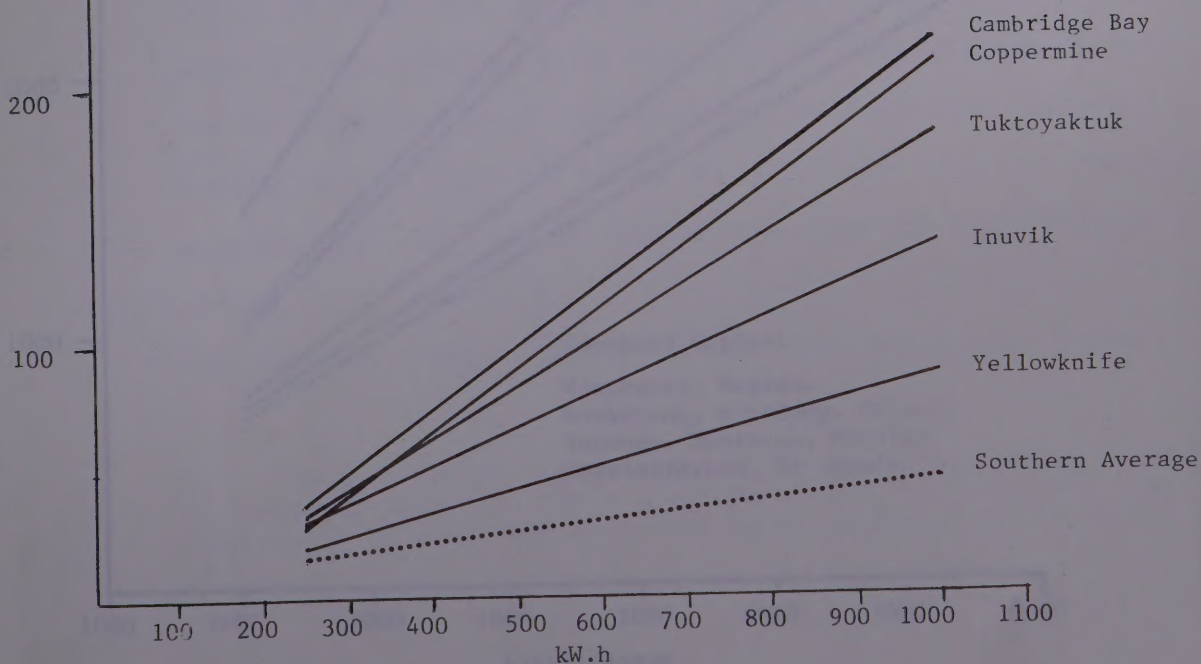
DECEMBER 1982

SOURCE: Stats Canada 57-203
NCPC Rate Schedule 1982

Southern Cities:

Vancouver, Regina,
Winnipeg, Saskatoon,
Ottawa, Toronto, Montreal,
Halifax, Charlottetown, St John's

Cost in Dollars

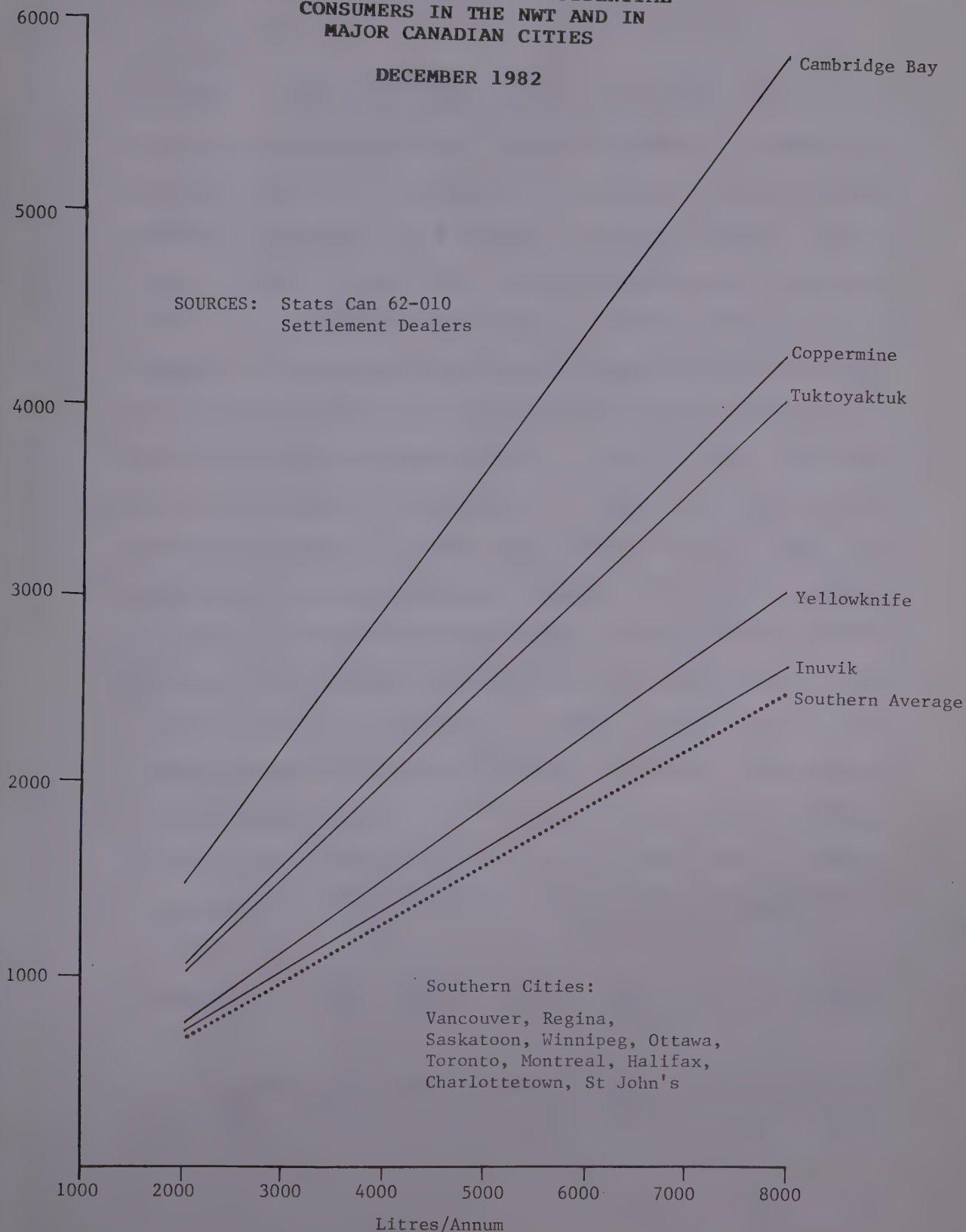


PRICE OF FUEL OIL TO RESIDENTIAL CONSUMERS IN THE NWT AND IN MAJOR CANADIAN CITIES

DECEMBER 1982

SOURCES: Stats Can 62-010
Settlement Dealers

Cost of Heating Fuel
\$/Annum



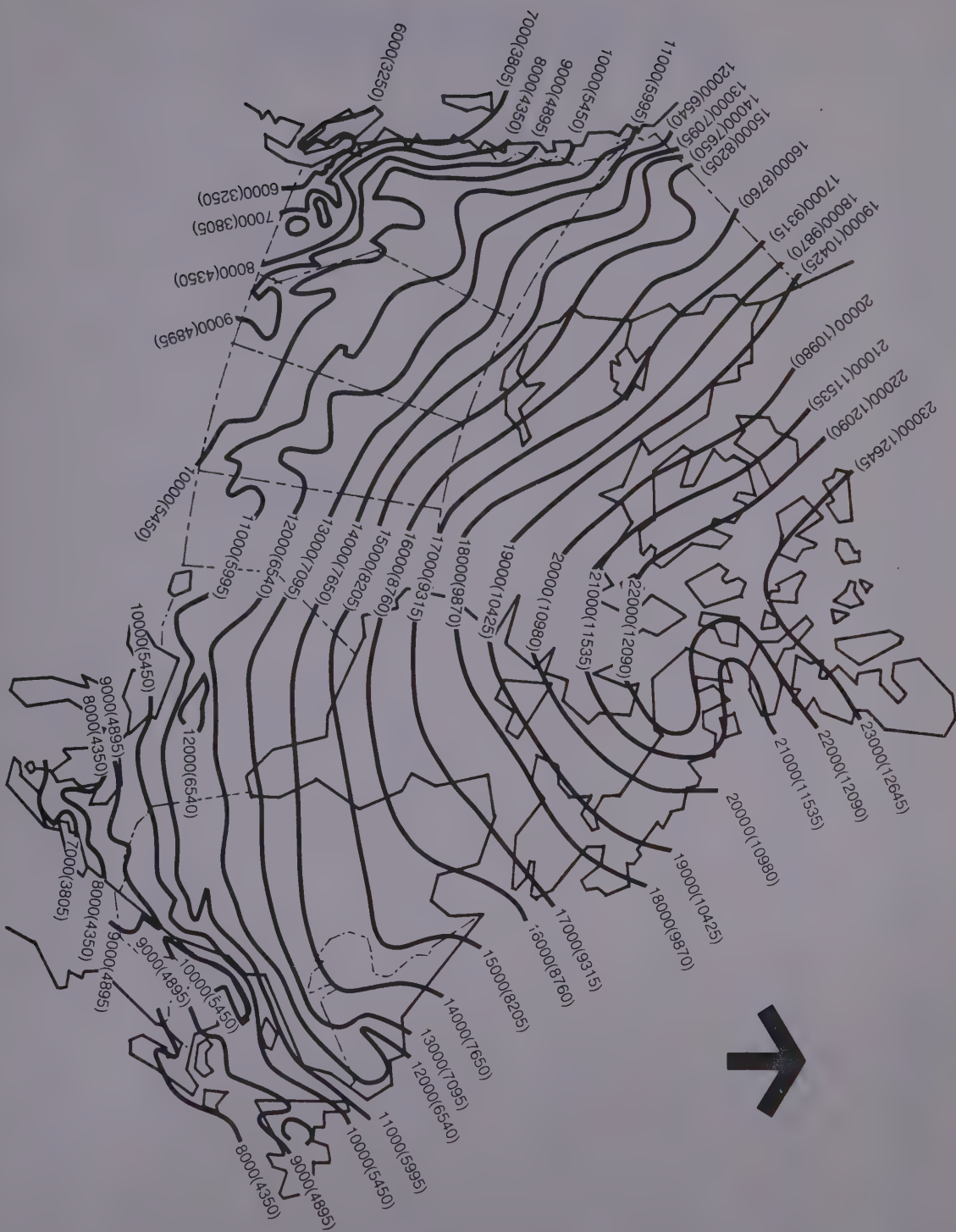
provide a rough indication of relative requirement.

The point is that, not only are Beaufort community prices higher, but residents of the area must consume greater quantities to maintain the same comfort level. Chart 4 shows this affect, indicating relative consumption for a comparable dwelling in various places.

Second, the price that private residents in the Beaufort pay for their fuel is highly subsidized by the territorial and federal governments. While it was an economic necessity for government to establish these subsidies initially, in the long run they will likely be phased out or significantly reduced. This action might be taken as the area establishes greater economic independence, to promote conservation, and to recognize the economic realities in Canada. Chart 5 shows the current level of subsidization in four of the larger communities in the Beaufort area. It records the fact that domestic consumers pay roughly 54 to 82 % of the cost of their heating oil, and 28 to 44% of the cost of their electricity.

Considering these two factors, the naturally higher

(1) "Degree Days" are calculated by accumulating the difference between 18°C and the mean temperature for every day in the year when the mean temperature is below 18°C.



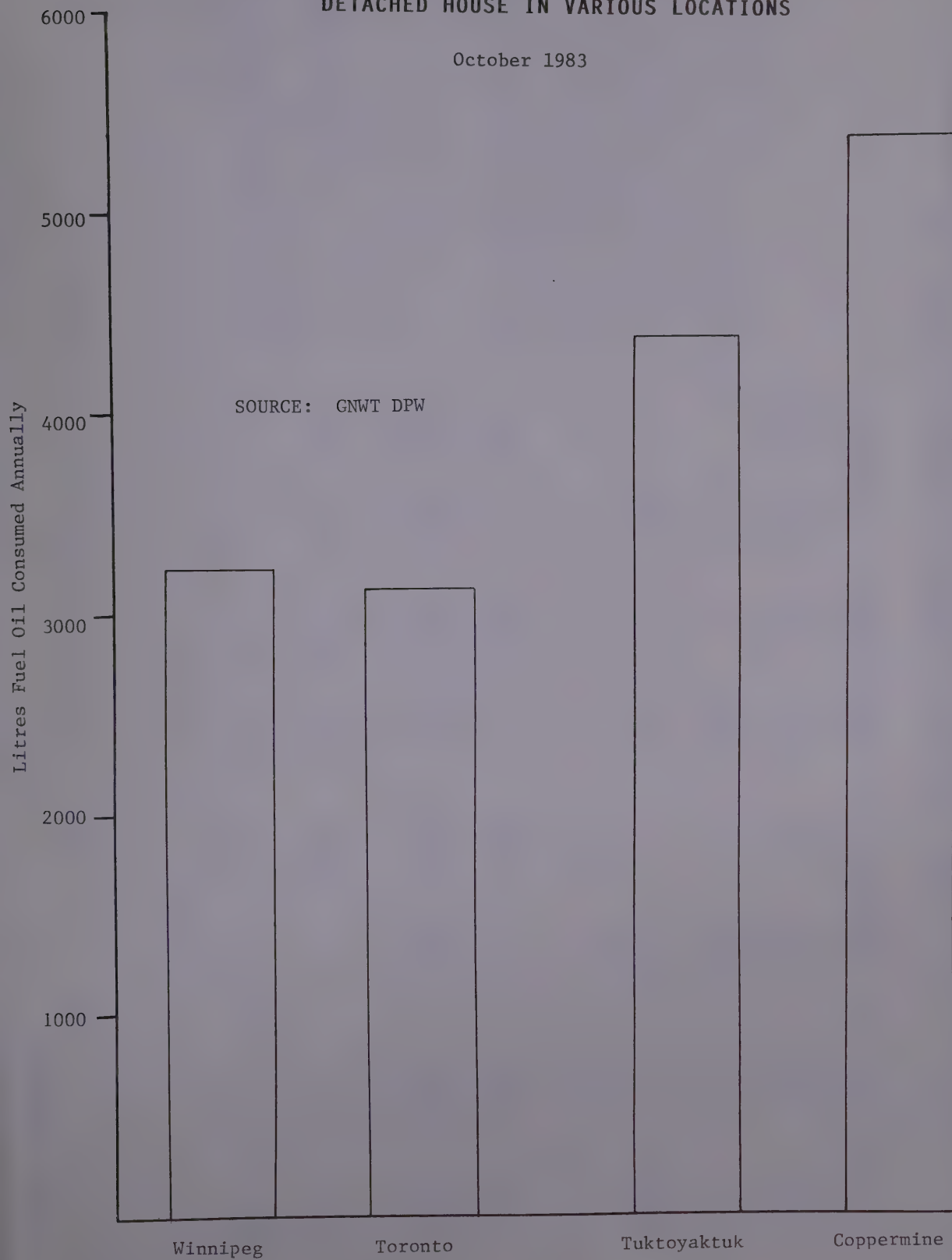
Annual degree days in Canada in Fahrenheit (with Celsius in parentheses)

Source: *Climatic Information for Building Designs in Canada, 1975*. Supplement to the National Building Code of Canada, 1970 (Ottawa: National Research Council of Canada).

CONSUMPTION OF HEATING OIL FOR A
STANDARD 3 BEDROOM SINGLE STORY
DETACHED HOUSE IN VARIOUS LOCATIONS

October 1983

SOURCE: GNWT DPW



**ANALYSIS OF CONSUMER'S SHARE OF DOMESTIC ENERGY COSTS
FOR CONSUMPTION OF 5460 LITRES (1200 GALLONS) OF HEATING OIL AND 12000 KWH PER YEAR
BY A PRIVATE RESIDENTIAL CUSTOMER IN NOVEMBER, 1983**

	INUUVIK		TUKTOYAKTUK		COPPERMINE		CAMBRIDGE BAY	
	<u>HEAT</u> ²	<u>ELEC</u> ¹	<u>HEAT</u>	<u>ELEC</u>	<u>HEAT</u>	<u>ELEC</u>	<u>HEAT</u>	<u>ELEC</u>
Consumer Pays Now	2090	1550	2110	1750	2110	1960	2110	1980
Federal Power Support Program Pays ³	-	1110	-	1400	-	1680	-	1750
Share of Electrical Costs Paid by Other Classes of Customers	-	820	-	980	-	3410	-	2060
Home Heating Fuel Subsidy Pays ⁵	-	-	670	-	780	-	1110	-
Govt. of NWT Retains Some cost ⁶	-	-	220	-	220	-	220	-
Effect of Artificial Norman Wells Price	450	-	450	-	450	-	450	-
TOTAL COST	2540	3480	3450	4130	3560	7050	3890	5790
Consumer's Share as a % of Burner Tip Cost	82	44	61	42	59	28	54	34
Economic or Actual Cost of Energy in the Noted Sector in ¢ per litre or kW.h	47.	29.	63.	34.	65.	59.	71.	48.

FOOTNOTES TO THIS TABLE ARE INCLUDED AS ANNEX I

consumption and subsidies, it is possible to compare in a rough way the actual domestic energy burden in the Beaufort area to that of southern Canada. This comparison is shown in Charts 6 and 7.

Obviously, there are very grave problems here. It is difficult to see how private residents could ever cope with their full energy costs under the existing supply system.

3. Price Instability

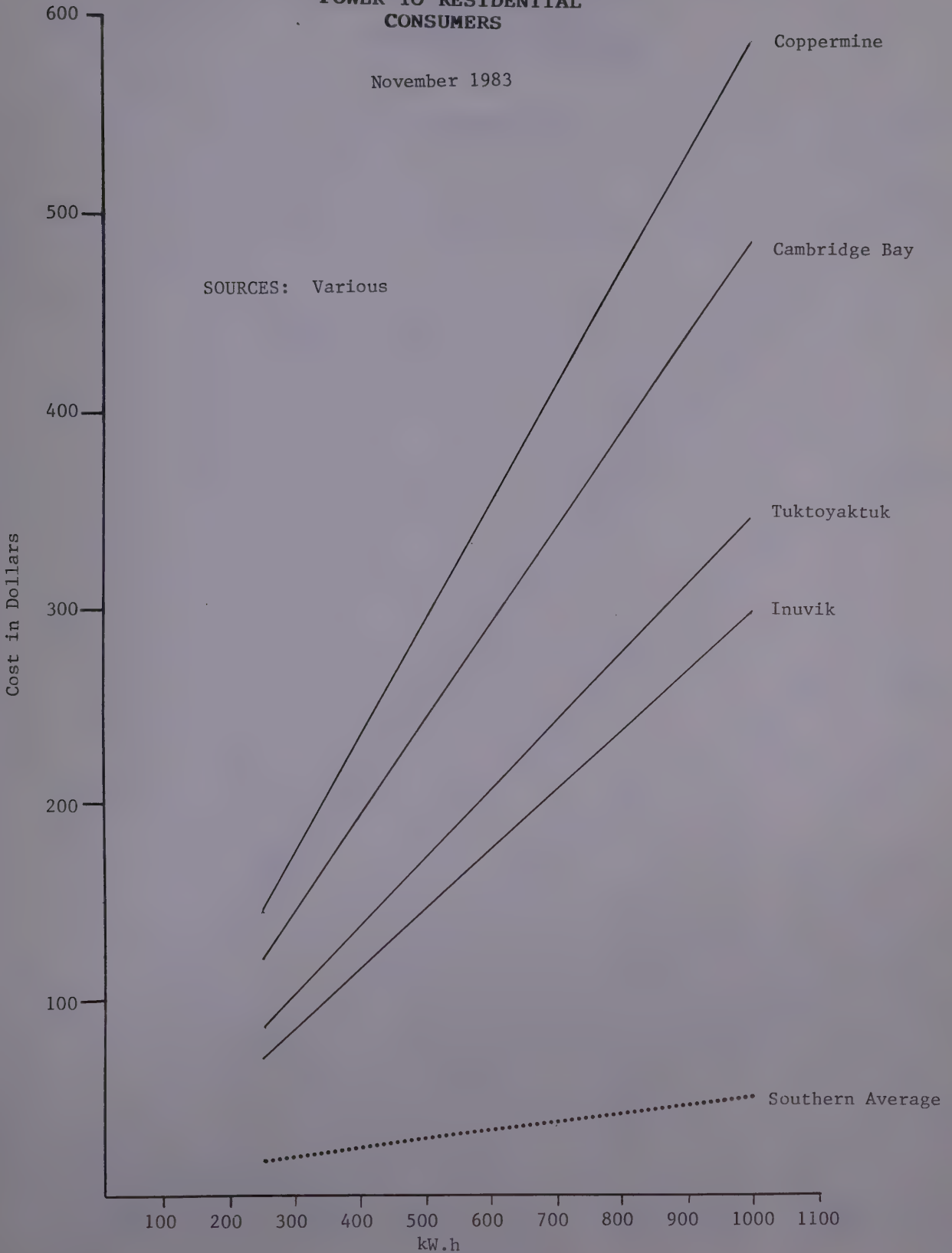
The economic slow down in the free world, coupled with extensive efforts to conserve, has chilled OPEC's ability to manage world oil prices. Indeed the world oil price has fallen and Canada now imports crude at about \$Cdn 37.50.(1) Many market analysts anticipate little if any growth in this price in real terms through the next few years. Very few dare to forecast too far into the future. The Canadian blended price, a product of federal/provincial negotiation and taxation regimes, has historically lagged behind world prices but has grown every bit as rapidly, and now stands at about

(1) The weighted average price (September, 1983) for imported crude landed at Montreal was \$Cdn 37.42.

UNSUBSIDIZED COST OF ELECTRICAL POWER TO RESIDENTIAL CONSUMERS

November 1983

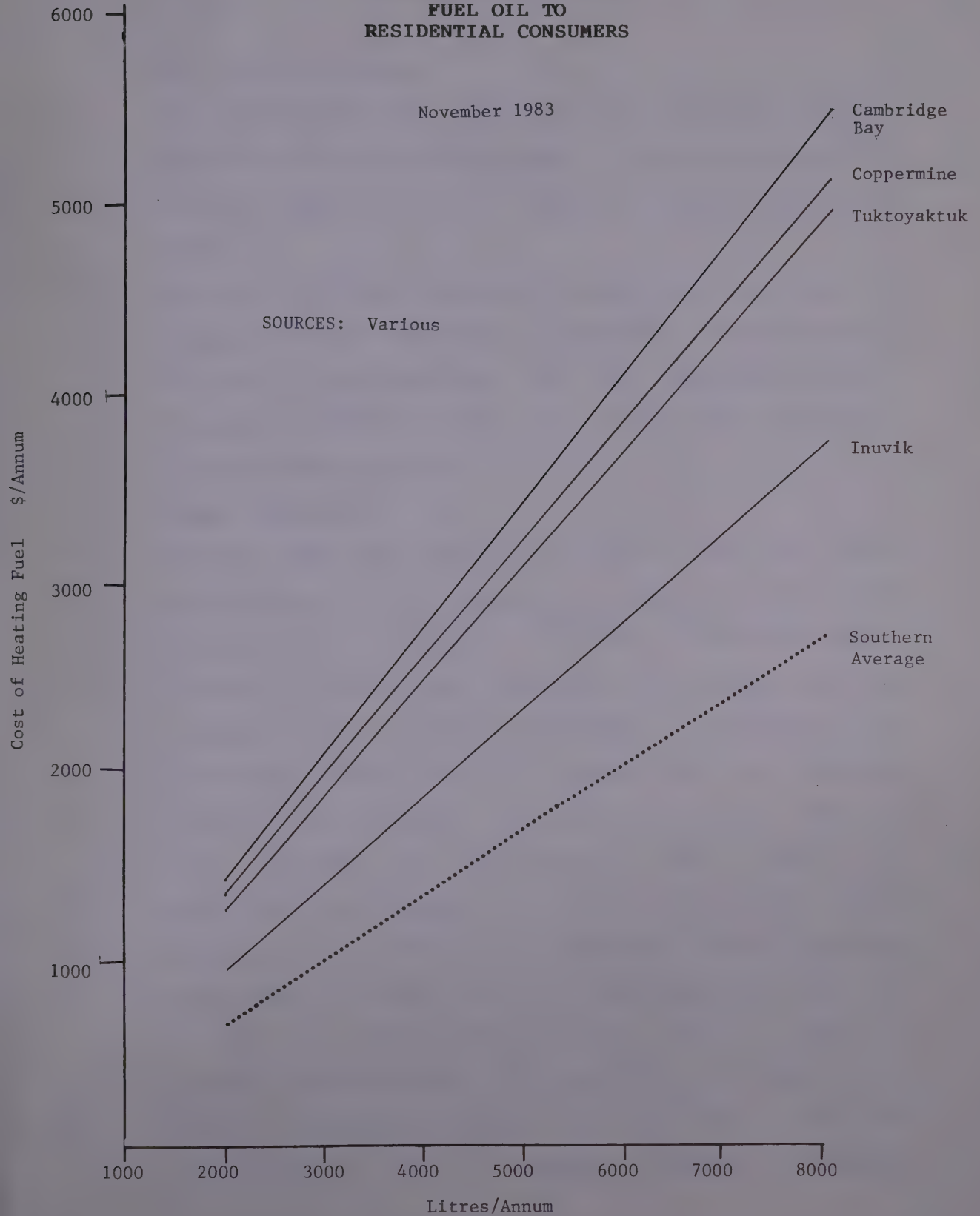
SOURCES: Various



UNSUBSIDIZED COST OF FUEL OIL TO RESIDENTIAL CONSUMERS

November 1983

SOURCES: Various



95% of world levels.

It appears that from this point on, Canadians will no longer be sheltered from changes in the world price but will be subject, more or less, to fluctuations that occur.

The point of this discussion is simply that the price of refined products delivered to Beaufort communities will continue to be uncertain. This fact introduces an undesirable element of risk to a society 100% dependent upon petroleum products.

4. Supply Insecurity

Putting aside the questions of price levels and price uncertainty, it is important to comment also on the question of the security of supply. We have always assumed in Canada that industry will supply whatever products, and whatever quantities of products, the marketplace calls for. If Canada were an isolated nation, self-sufficient in crude oil, such would be true. In actual fact, neither is the case. Canada is a member of the International Energy Agency (IEA), along with twenty other free world countries. These countries have agreed to share crude oil shortages should any one of them be affected by a crisis in the world oil market. As an example, if a conflict in the Middle East forced a production shutdown that resulted in any IEA country losing 7% of its crude oil supply, a sharing

agreement could be triggered. This would force Canada to share crude oil by diverting its imports elsewhere, or shipping domestic crude overseas. As a case in point, if Iran had successfully carried out her recent threat to close the Straits of Hormuz, such an international sharing might have been required.

Any reduction in Canada's daily crude oil supply would require reductions in the market for refined products. These reductions would be manageable, but simply, people would have to cut back. Regions that are wholly dependent upon oil, as we are in the Beaufort, are bound to feel these cutbacks more.

C. **WHAT GOALS MUST BE PURSUED WITH RESPECT TO ENERGY SUPPLY IN THE NORTHWEST TERRITORIES?**

If we step back and look at the question of an energy supply system in the abstract, we can define certain characteristics or goals that should be pursued.

1. All other things being equal, **a local resource should be used.** Whether this is wood, a refined petroleum product or natural gas, economic benefits would accrue to the public in terms of involvement with the production and distribution of the resource. Production and use of a local resource ensures that a greater amount of wealth remains in the community. Transportation and some other costs are avoided.

2. All other things being equal, the burner tip **price** should be as low as possible and within the means of consumers.
3. The supply must be **secure**, with a low probability that supply disruptions will occur.
4. The supply must be **safe** and otherwise **socially acceptable** .

D. A WEALTH OF BETTER IDEAS - THE SEARCH FOR A BETTER ENERGY SUPPLY SYSTEM

It is obvious that the current oil based energy system does not meet all of the criteria that might be considered ideal, and is never likely to.

It is necessary, then, to explore other energy supply possibilities that might in the long run meet these goals in a more complete way. Some study of these alternative has already taken place or is currently underway. More work is required in the near future. Following are the possibilities that have been identified and the state of their study as I am aware of it.

1. Natural Gas and Propane

Various natural gas and propane studies have been made in the past for the supply of Inuvik and Tuktoyaktuk. The result of these has been inconclusive, as each has by and large been limited in scope to one or another gas field or end use. As a result, interest in the prospects has continued. In order to determine

in a final way the economic viability of these energy sources, the Government of the Northwest Territories, together with the Government of Canada, is conducting a major study of the ways in which communities on the Inuvik road system might be supplied. This study will be completed by March 31, 1984

2. Refined Petroleum Products from a Beaufort Refinery

Studies have been conducted by industry, the Department of Indian and Northern Affairs and by the Committee for Original People's Entitlement to determine the economic feasibility of a small shore-based or barge-mounted refinery. This refinery, called a "topping plant", would in concept supply motor gasoline and diesel fuel to the Western Arctic market. I understand that initial studies have shown some likelihood of economic feasibility if all sectors of the market were supplied. A major problem would be the disposition of the large proportion of reduced crude produced.

3. Methanol

Methanol is an alcohol that can be produced from natural gas. It has been demonstrated by the Government of the Northwest Territories before the National Energy Board in its hearing of the Arctic Pilot Project, that this product warrants further study as a fuel for space heating and electrical generation. To my knowledge no further work on this option is being undertaken at this

time.

4. Waste Heat Recovery

The Department of Public Works of the Government of the Northwest Territories, and Energy, Mines and Resources Canada are reviewing the economics of capturing the heat produced as a byproduct of electrical generation by the Northern Canada Power Commission in Inuvik. This heat is currently exhausted to the atmosphere but could be reclaimed for distribution to the town in the utilidor system. Included in this work, is a review of the utilidor design and an assessment of the economics of its construction to improve efficiency.

5. Nuclear

Atomic Energy of Canada Ltd. has studied NWT communities to determine the market potential for a small reactor to produce electricity and hot water for heating. If their design work is successfully concluded, we may have an economically viable nuclear alternative in the 1st half of the next decade.

6. Coal

Coal has been studied in the past as a heating source for individual homes in the Inuvik area. A recent study reviewed how coal could be used in Pond Inlet as a space heating and electrical generation fuel. These results

may be applicable to Beaufort area communities.

7. Wood

Fuelwood use for space heating could be extended in a few communities in the Southern Delta area. By and large, wood will not play a large role in the energy future of the Beaufort area.

E. THE PROBLEM OF CHOICE

This brief enumeration of ideas and effort serves to bring out some key facts.

First, there are many people involved in the search for a better energy supply. Some are attempting to serve their own interests, others are discharging their responsibilities to the public at large. All have a stake in the solution.

Second, some alternatives serve one market use (nuclear for space heating), others serve many (petroleum products or methanol for electrical generation, space heating and transportation).

Third, some alternatives serve one market area to the exclusion of others (e.g. Inuvik) while others are of broader benefit.

What is most important, but perhaps not so evident, is that the ideas cannot be pursued in isolation of one another. Each impacts the viability of the others, principally by reducing the size of the market available. To illustrate this point, the natural gas/propane system idea, and the topping plant idea, are mutually exclusive concepts. Neither would likely be viable with the other in place. The Western Arctic market is too small to

warrant extensive and competing infrastructure development. Considering the constraint of market size, the communities will likely have to live with whatever system is chosen for the foreseeable future.

It is imperative then to plan the development of the area's energy supply system in order to achieve the long-run optimum. Singular approaches fostered by one community, proponent or interest group to the exclusion of other market groups are unlikely to meet this imperative.

F. A PROCESS FOR RESOLUTION

Considering the energy problems, the potential and the promoters described previously, the Panel is urged to include in their findings, recommendations aimed at fostering the planned development of a preferable alternative energy system.

1. Because the Beaufort is an area that is remote from the rest of Canada, the hydrocarbon resources should not be considered just numbers in the equation of the National supply and demand balance. **Rather, Canada should reserve a portion of the resources for the future use of the citizens of the area .** It would be poor national strategy to deplete a producing area which could provide a future local supply, thereby ensuring for all time to come that refined products would have to be shipped North from a distant refinery. The Norman Wells field

is a case in point. This pool will be depleted within the next 30 years as a result of the pipeline. Had no pipeline been built, current production levels could have been maintained for about 100 years, providing a continuation of the current cost benefit to northerners for at least two additional generations.

2. The industrial development taking place now in the Beaufort brings to the area a tremendous expertise in energy project engineering and construction. In addition, the energy demand created by this development is a significant portion of the area's total need.

Therefore, industry should be encouraged to assist in the development of energy supply alternatives by co-operating in new source investigations and if economically viable solutions are found, dedicating resources to their development.

A precedent for this recommendation exists. The Northern Pipeline Act of 1977 regulates the construction of the natural gas pipeline between Alaska and the lower 48 States.

The Act requires Foothills Pipe Lines (South Yukon) Ltd. to construct high pressure laterals to the town gates of eight specified Yukon communities. The company is further required to make a financial contribution in

respect of providing this gas of 2.5 million dollars (\$1977).

Any other communities that wish to receive a connection will receive a financial contribution from the Company of \$2,500 (\$1977) for each customer, not to exceed \$2.5 million (\$1977) for Yukon as a whole.

Gas supplied to Yukon communities will be replaced by Yukon in Alberta at the going Alberta border price.

3. Because of the size of the Beaufort area energy market, and the number of major energy users, it would be inappropriate for a single proponent to develop an energy alternative for his own purposes to the exclusion of the regional requirement. Rather, the major energy users should collaborate with government in a research and development program with the intention of installing an alternative energy supply system that will meet the area's need for many years to come.

I urge the panel to recognize their unique opportunity to contribute to the resolution of consumer energy problems in the Beaufort area. You have an opportunity to put forward well-formed recommendations to interested Ministers of the Federal Government.

ANNEX I
FOOTNOTES TO CHART 5

1. Electrical rates charged by NCPC on a monthly basis as of November 8, 1983 for residential non-government service are as follows:

	Service Charge	¢/kW.h	
		First 300 kW.h	Over 300 kW.h
Inuvik	5.30	17.63	23.23
Tuktoyaktuk	5.30	18.47	28.78
Coppermine	5.30	18.18	34.85
Cambridge Bay	5.30	19.65	35.20

Electrical rate charged by ICG (Plains Western) Ltd. on a monthly basis as at November 8, 1983 for residential service in Yellowknife averages \$.0844 for the first 700 kW.h for the purposes of the Federal Power Support Program.

2. Prices in effect in the communities as on November 8, 1983 were in ¢/litre:

Inuvik	38.2
Tuktoyaktuk	51.0
Coppermine	53.0
Cambridge Bay	59.0

3. The Federal Power Support Program subsidizes the first 700 kW.h of consumption for this class of customers to the Yellowknife rate.

4. Residential non-government customers generally pay less than 100% of the cost of their service, being subsidized by other service classes. Following are the percentages of costs recovered in revenue as listed in Northern Canada Power Commission, Proposed Rate Adjustments, Effective April, 1983, Northwest Territories Rate Zone:

Inuvik	76.3%
Tuktoyaktuk	76.3%
Coppermine	51.7%
Cambridge Bay	64.4%

5. The Home Heating Fuel Subsidy reduces the price of the first 1500 gallons consumed in one year to the Yellowknife price. The current Yellowknife price is \$1.76/gallon or 38.6¢/litre.
6. The Government of the NWT distributes fuel in most NWT communities. No charges are applied to the price to recover the capital invested in fixed facilities or to finance the annual bulk purchase of inventory. If these charges were applied, as they would be by a private firm, 4¢/litre would be added to the product price.
7. Refined Petroleum Products FOB Norman Wells are pegged at the price for similar product FOB Edmonton. This system has been established to enable a valuation of the crude produced from the Norman Wells field and was previously justified on the basis of the isolated nature of that field. In effect, northern residents on the Norman Wells supply route have received a subsidy. One way of attaching a value to this subsidy is to impute to the product costs the transportation cost of a unit of product from Edmonton to Norman Wells. The figures shown in the chart represent that transportation value.

The transportation rates in force in November, 1983, for large bulk fuel shipments are:

CN Rail, Edmonton to Hay River \$1.91/hundredweight

NTCL, Hay River to Norman Wells \$2.70/hundredweight.

P-50 heating oil weights 1.8 pounds/litre.

CURRICULUM VITAE

Mr. Hart received a B. Comm degree from St. Patrick's College in Ottawa in 1965. After graduation, he joined Bell Canada's Business Information System group in Montreal. There he developed and taught computer system design courses and managed the department's computer training group.

Mr. Hart joined Ontario Hydro in 1968 as a Senior Systems Analyst to supervise the development of several major computer systems.

In 1973, he moved to Yellowknife to join the territorial public service as Manager of Systems and Program Development. In this capacity he supervised the development of all computer systems for the government until granted leave to return to university in 1977.

In 1979, Mr. Hart graduated with distinction from Queen's University at Kingston with an MBA. He returned to the Department of the Executive to develop the Management Control System in use in the territorial government today.

After implementation of that system, Mr. Hart was appointed Special Assistant to the Minister responsible for Energy. This led to his current assignment to the Energy, Mines and Resources Secretariat and his responsibility for energy policy matters.

Mr. Hart is an outdoor enthusiast. He coaches the Yellowknife Ski Team and is active in a wide variety of community organizations and activities.

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